

REPORT DOCUMENTATION PAGE

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8. PERFORMING ORGANIZATION
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MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

22 May 2002

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2002-128**
C.T. Liu (PRSM), "Investigating the Effects of Specimen Thickness and Pressure on the Crack Growth Behavior of a Particulate Composite Material"

ASME Winter Meeting
(Blacksburg, VA, 24-28 June 2002) (Deadline = 19 June 2002)

(Statement A)

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.

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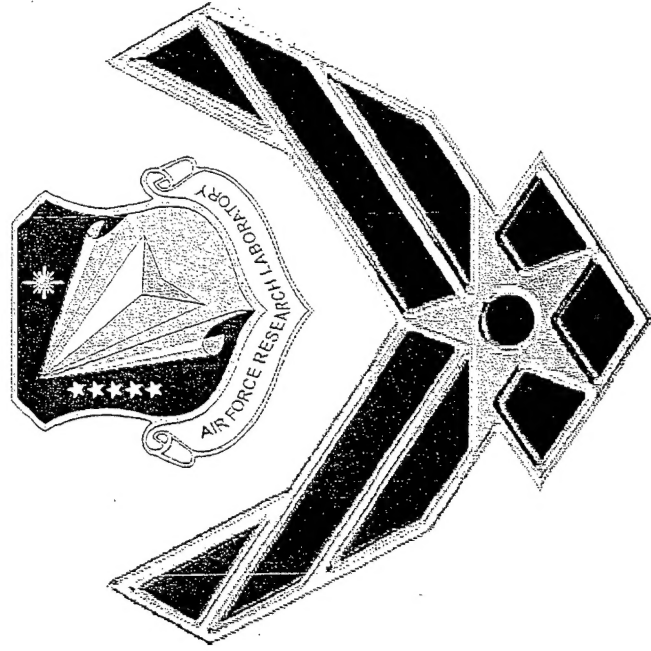
4. This request has been reviewed by PR for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability

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APPROVED/APPROVED AS AMENDED/DISAPPROVED

PHILIP A. KESSEL Date
Technical Advisor
Space and Missile Propulsion Division

Investigating the Effects of Specimen Thickness and Pressure on the Crack Growth Behavior of a Particulate Composite Material

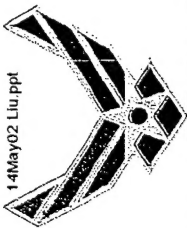


C. T. Liu

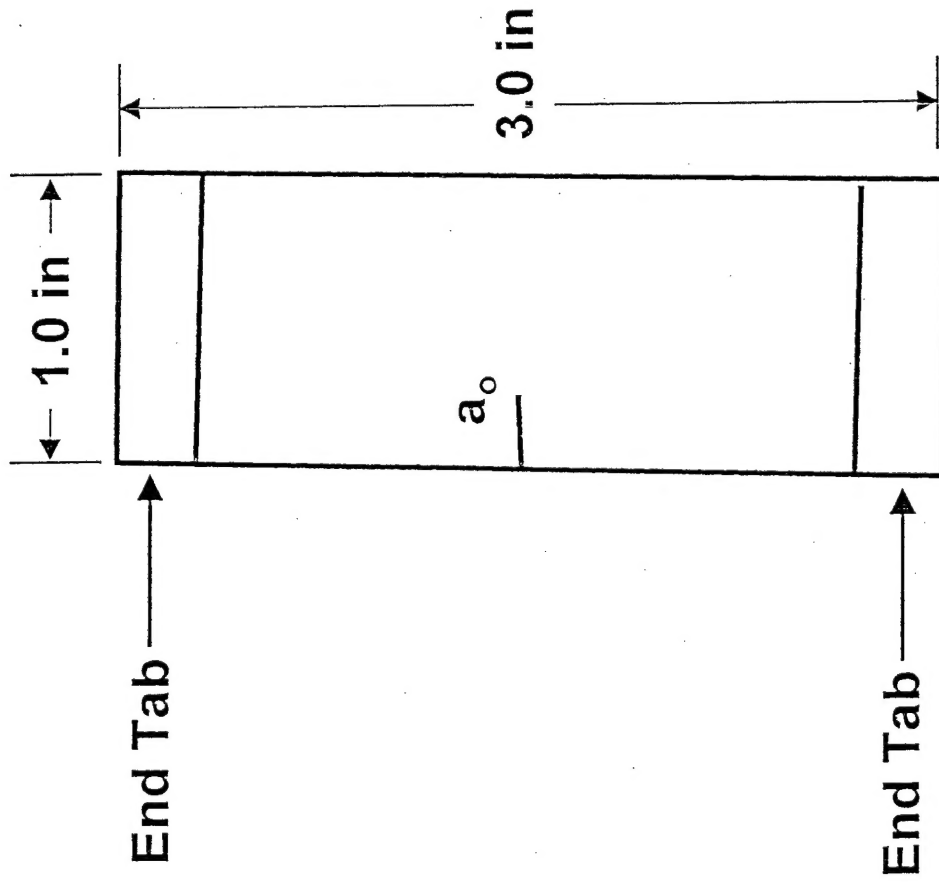
Principal Research Engineer

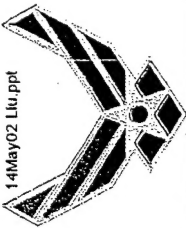
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Air Force Research Laboratory

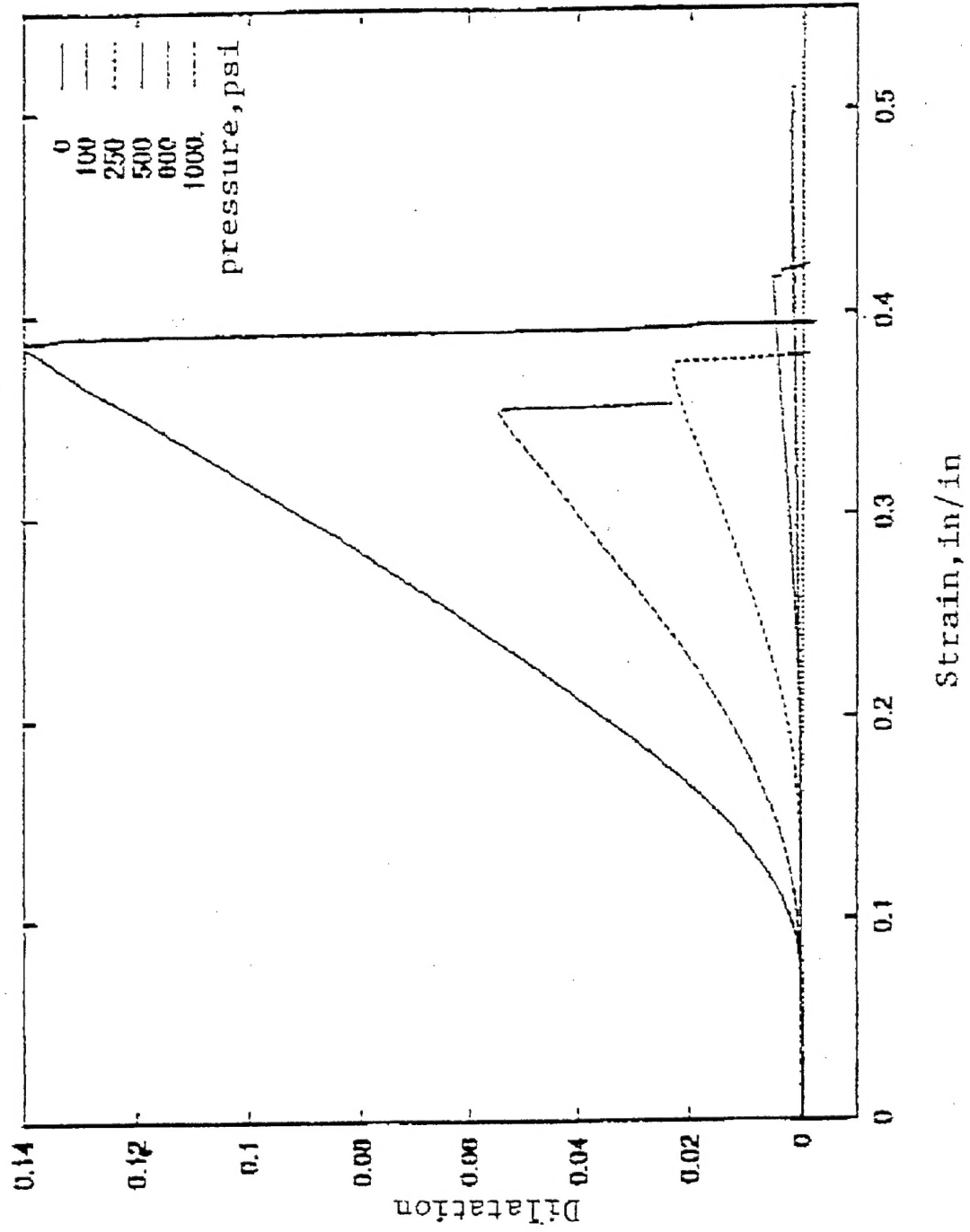


Specimen Geometry



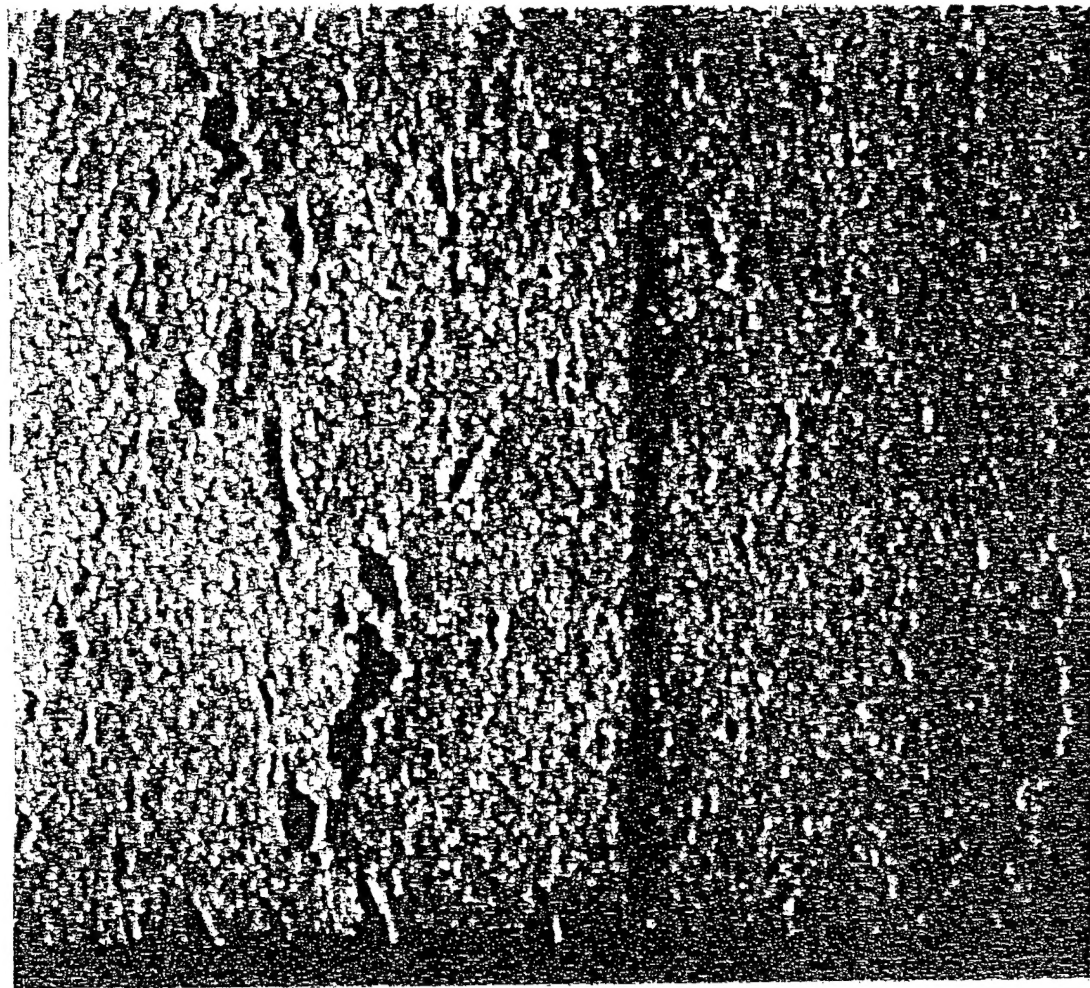


Volume Dilatation vs. Pressure





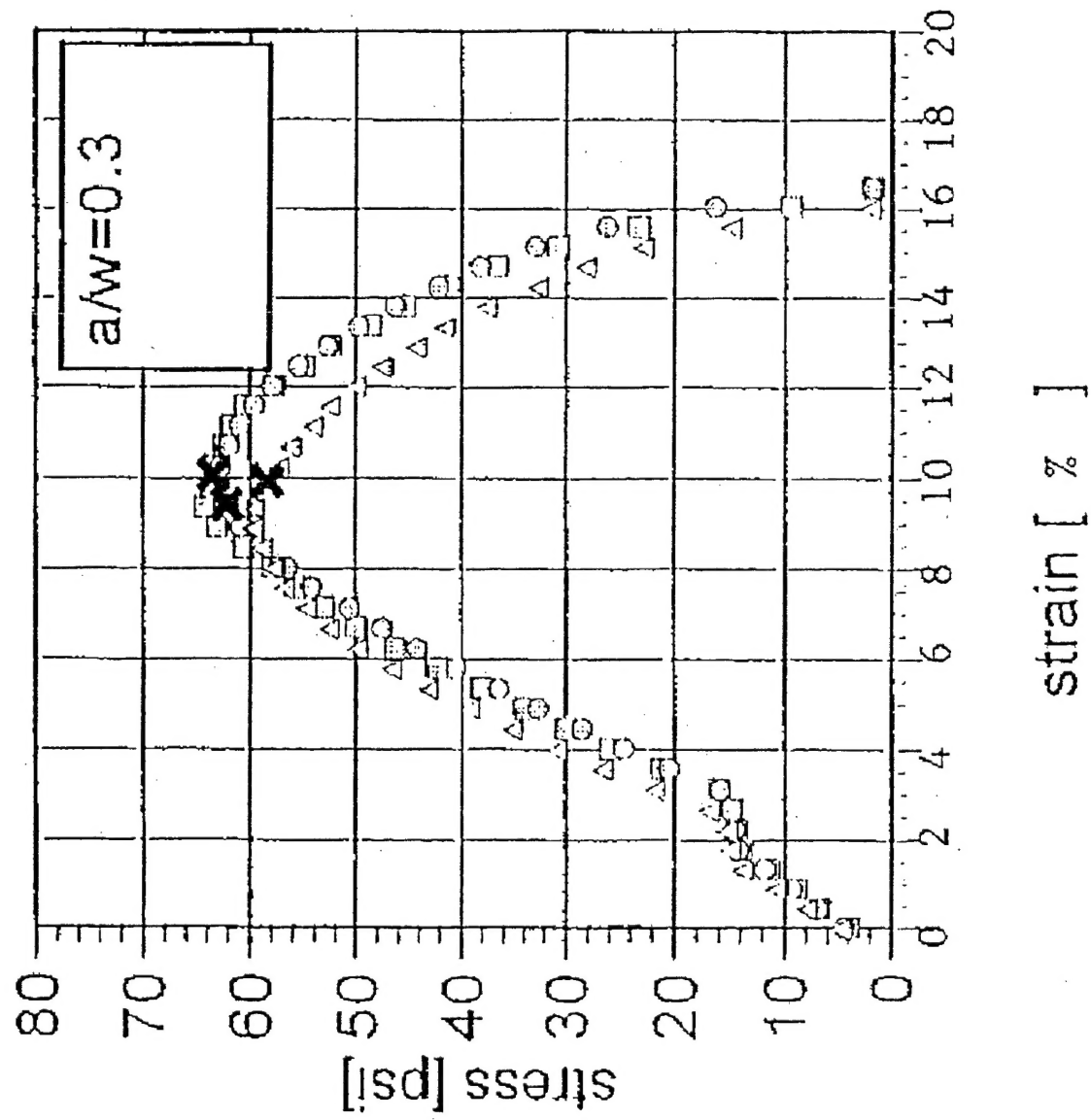
Microcracks in the Specimen under Pressure





14May02 Liu ppt

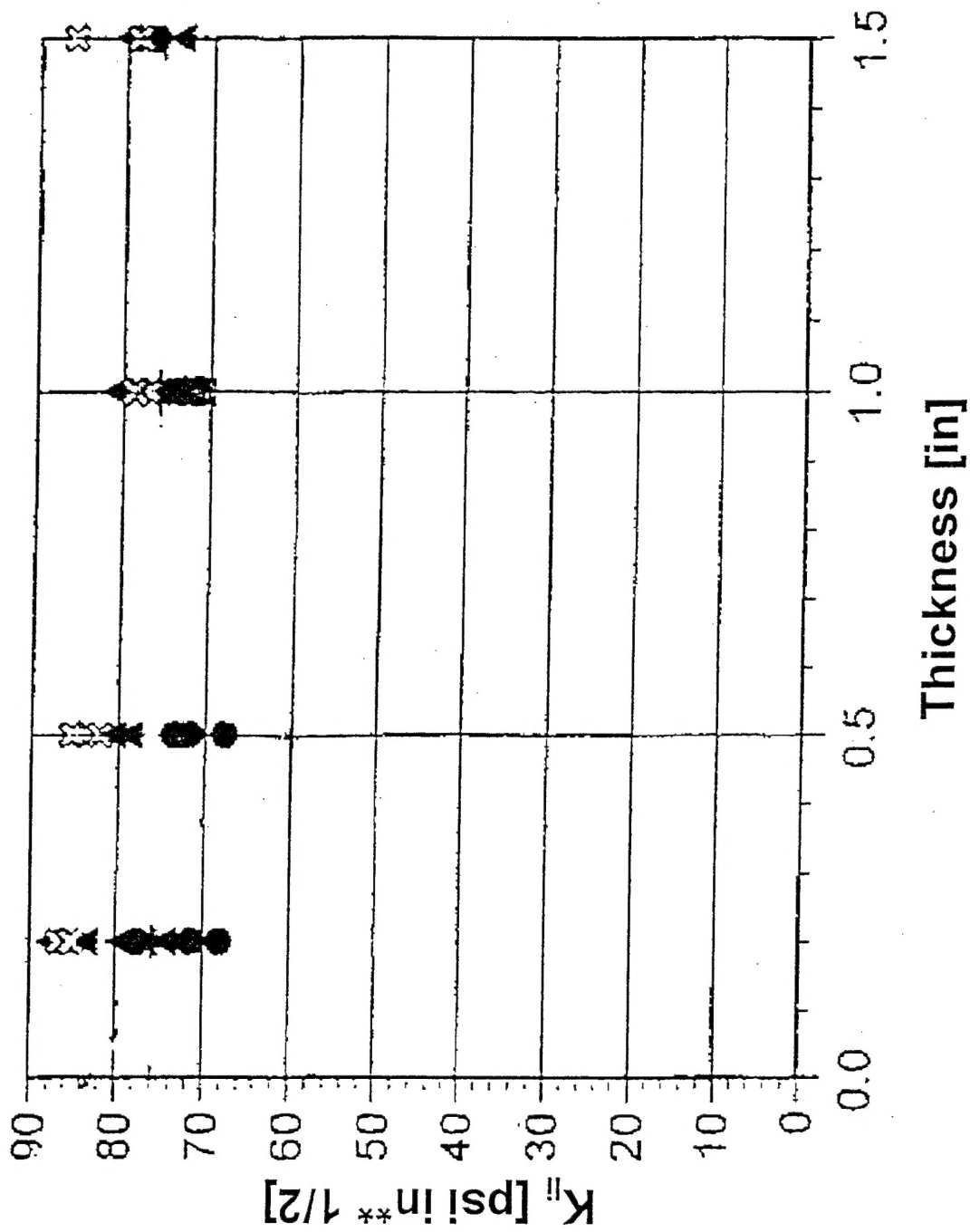
Stress-Strain Curves under Ambient Pressure

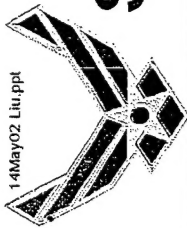




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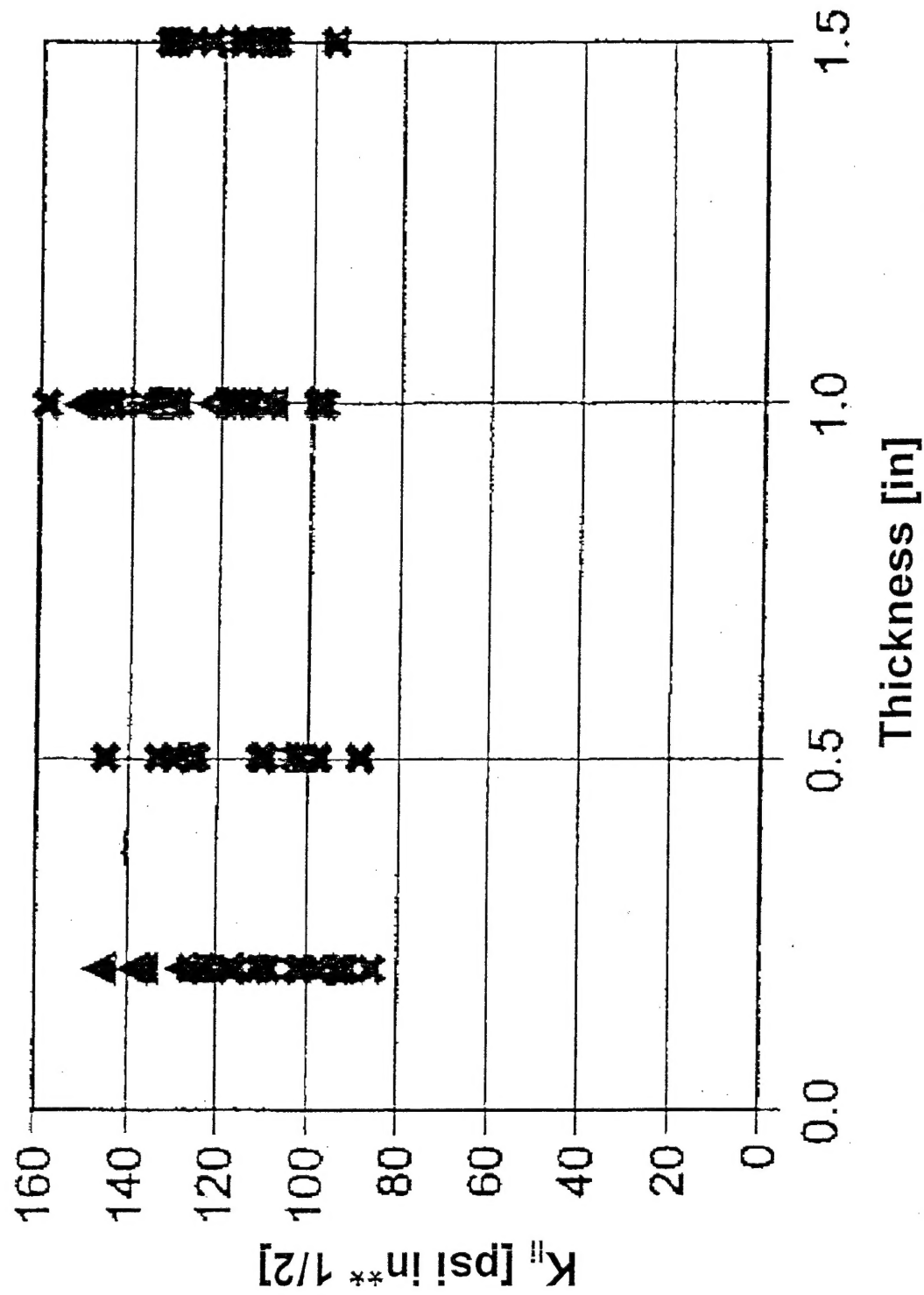
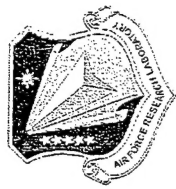
Mode I Stress Intensity Factor vs. Specimen Thickness. (Ambient Pressure)

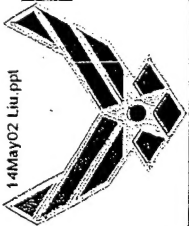




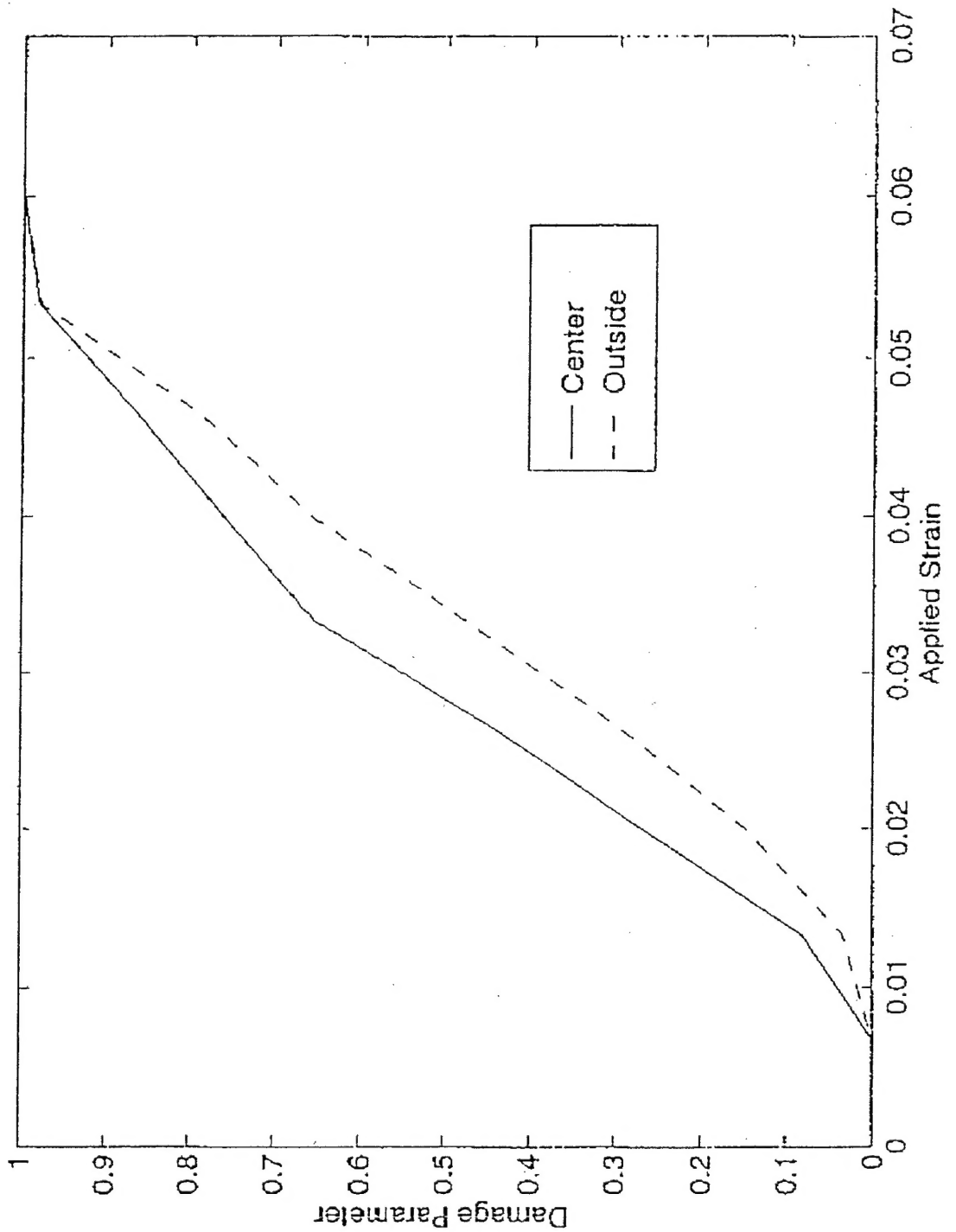
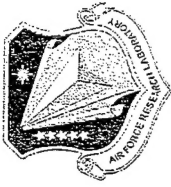
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Mode I Stress Intensity Factor vs. Specimen Thickness. (1000 psi Pressure)





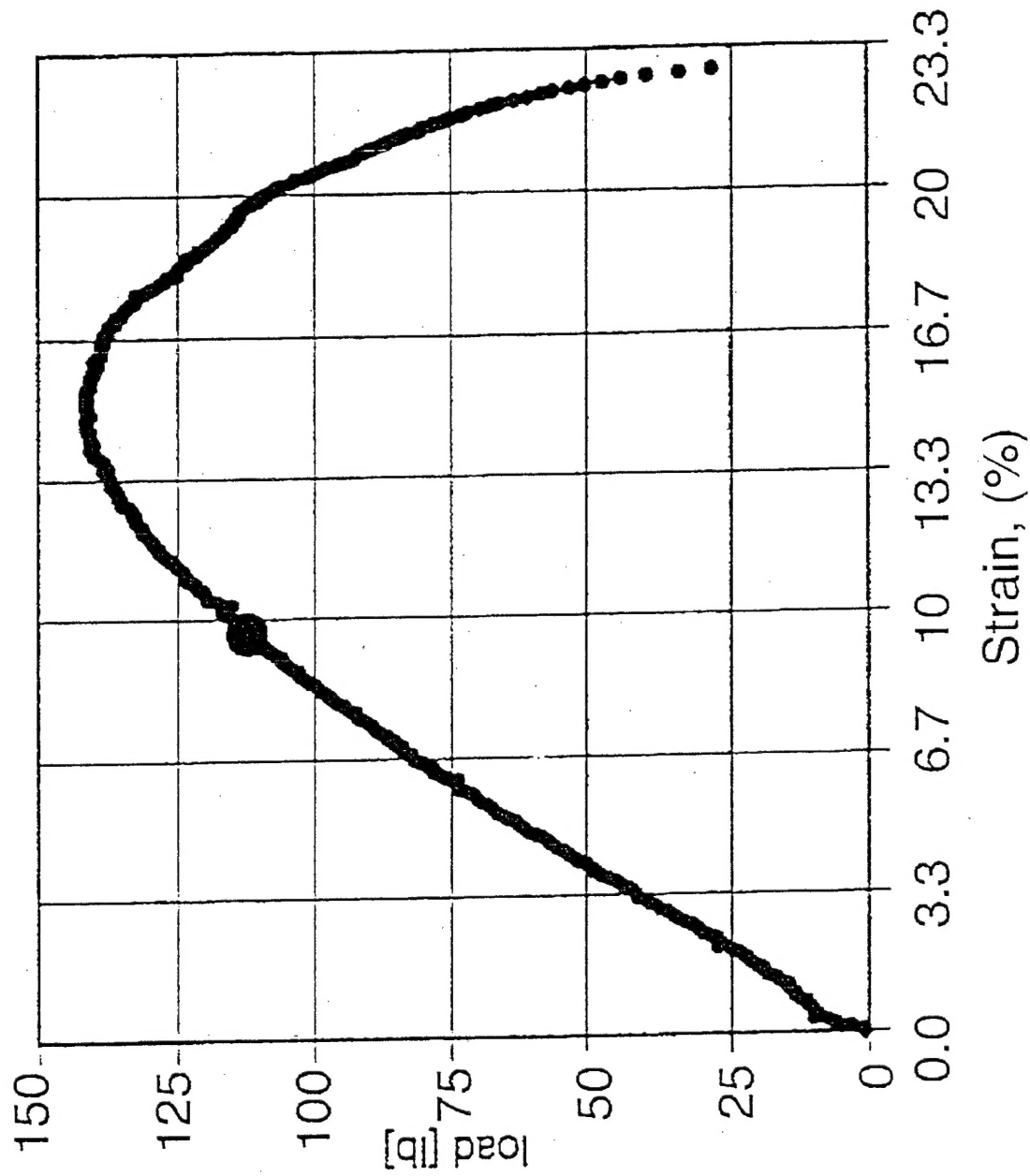
Damage Distribution near the Center and the Surface of the Specimen

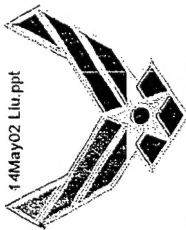




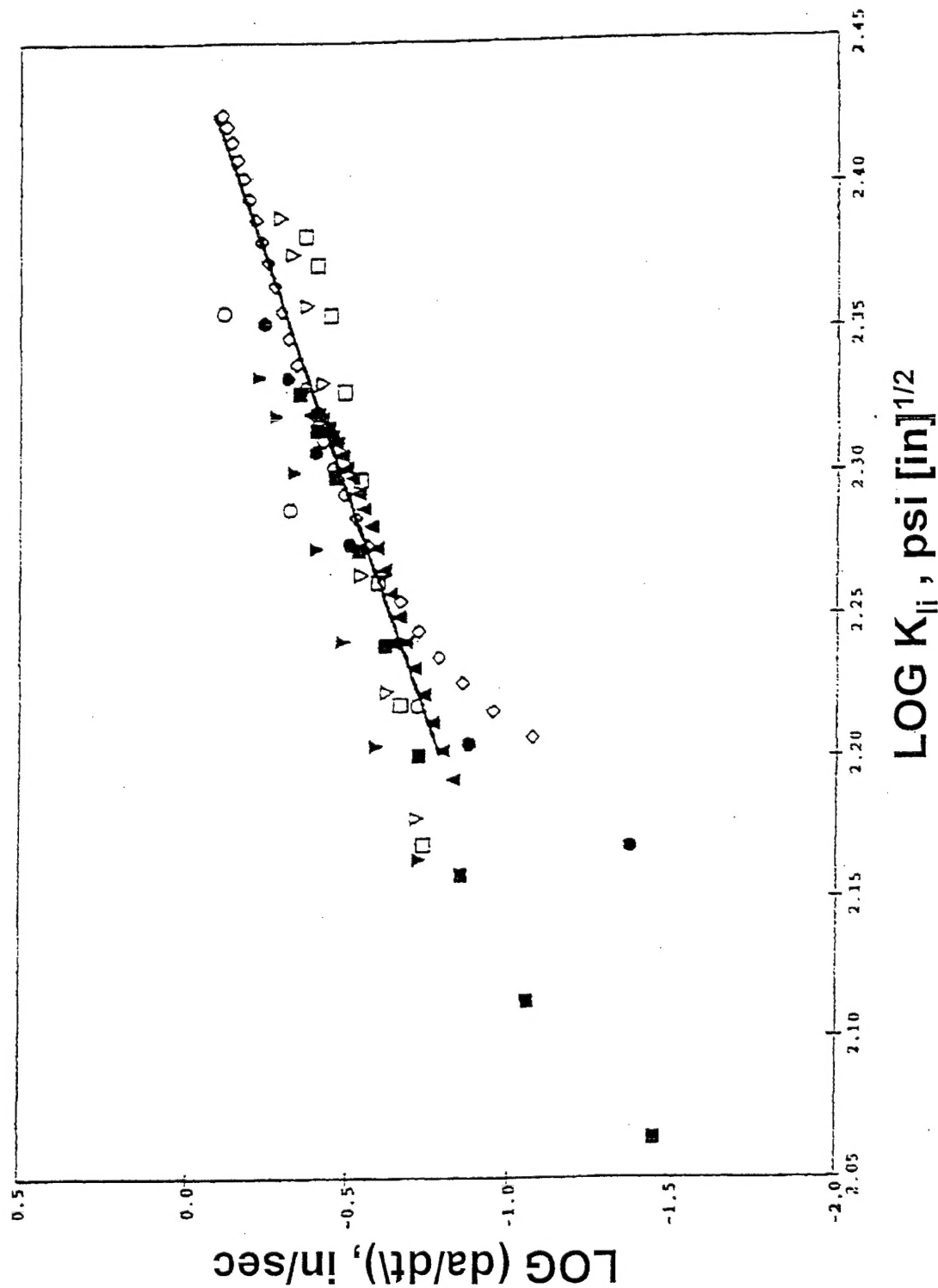
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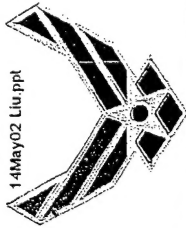
Stress-Strain Curve under 1000 psi Pressure





Crack Growth Rate vs. Mode I Stress Intensity Factor





Conclusions



1. The critical Mode I stress intensity factor, K_{II} , for the onset of crack growth is insensitive to the specimen's thickness.
2. Plane strain fracture toughness does not exist for this material.
3. Brittle fracture occurs under ambient pressure, whereas a considerable amount of stable crack growth occurs under 1000 psi confined pressure.
4. A power law relationship exists between the crack growth rate and the Mode I stress intensity factor.



Objectives



- Investigate the Effects of Specimen Thickness and Confined Pressure on the Crack Growth Behavior of a Particulate Composite.
- Specimen Thickness (in.): 0.2, 0.5, 1.0, 1.5.
- Confined Pressure (psi): Ambient, 1000.